

MOLT AND TAXONOMY OF RED-BREASTED NUTHATCHES

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ROUTINE identification of a small series of Red-breasted Nuthatches (*Sitta canadensis*) at the U. S. National Museum necessitated a review of the recently proposed (Burleigh, 1960) division of that species into two subspecies, *S. c. canadensis* in eastern North America and *S. c. clariterga* in the west. Most authors who have dealt with the species recently have not used the trinomials and have not commented on the recognition of geographic variation in this species (e.g., Mengel, 1965; Johnson, 1965; Godfrey, 1966). However, Todd (1963:533) commented that the proposed form "does not appear to me to be sufficiently well characterized," and Phillips, Marshall, and Monson (1964:114) stated that "careful examination of recent fresh fall skins from Maine and Arizona fails to reveal racial differences. . . ." Bailey and Niedrach (1965:582) used the name *clariterga* without taxonomic comment.

Despite the consensus that the race *clariterga* is not valid, it seemed advisable to review the material on which its proposal was based. Burleigh (1960:212) stated that *S. c. clariterga* differed from nominate *canadensis* by having the "upperparts lighter and more bluish and lacking to a large extent the grayish wash characteristic of the nominate race." In a preliminary examination of subspecifically identified material at the U. S. National Museum, the characteristics of the two groups of specimens as outlined by Burleigh (1960) were plainly evident to me. However, I was disturbed by the large number of eastern specimens that had been designated as members of the western race, and vice versa; the proportion seemed too high even for such an erratic wanderer as the Red-breasted Nuthatch. A more detailed study convinced me that the racial division should not be recognized. More importantly, I believe, reassessment of the evidence has made it possible to state rather precisely how it was misleading and why the name *clariterga* must be considered a synonym of *canadensis*. This could not have been accomplished without examination of the material used in the original study. The conclusions based on the study of the material in the U. S. National Museum were checked and verified by examination of the large series of *Sitta canadensis* at the American Museum of Natural History.

MOLT AND AGE CHARACTERS

To determine whether variation related to age might either mask or enhance any trends of geographic variation in color, I studied specimens in the complete late summer molt in an attempt to develop criteria for the separation of

age groups. Even though no such criteria were found, a brief discussion of this phase of the study is a necessary prelude to a consideration of the basic problem.

Ageing.—The plumage of juvenile Red-breasted Nuthatches is extremely similar to that of adults. The similarity is enhanced by the structure of the feathers of adults, which, with their widely spaced barbs, have the soft appearance usually associated with juvenile birds of passerine species. The difference in structure between the adult and juvenal body feathers is most noticeable on the ventral surface, but since this area is among the first to undergo molt, the distinction is soon lost. Juvenile males have dull rather than shiny black caps, but this distinction also is soon lost because of the rapid progress of molt. Young females have a duller gray pileum than adults, without black feather edgings, but the presence of the latter is highly variable even in adults.

Birds which are involved in the postnuptial or postjuvenal molts can be aged as first-year or adult by the fact that only adults molt the flight feathers. This distinction can be made through virtually the entire period of molt, since the inner primaries of adults are among the first feathers to be lost and the outer primaries are among the last to complete growth. In the final stages of molt, when the primaries of adults have all regrown, the relatively older remiges of the juveniles are more worn than those of adults, but I have been unable to use this feature consistently or with confidence to age specimens. I have not found any differences of shape or color between the juvenile and adult flight feathers or coverts which might be used to separate age groups, and there seems to be no way to distinguish adult birds from first-year birds after the assumption of the adult or first basic plumage.

Molt in adults.—The complete postnuptial (prebasic) molt of adults may begin as early as the middle of June. Molt of the primaries begins slightly before molt of the body feathers, but replacement of the latter proceeds rapidly and the change of plumage in the two areas is completed more or less simultaneously. Molting adults in the collections studied were too few and variation too great to permit statements of precise correlation between primary and body feather molt, but most stages of primary molt were represented and a few generalizations can be made. Fewer females than males were available and the comments presented here are based mainly on the males, but there seems to be no essential difference between the sexes either in timing or progress of the complete molt.

At the time that the first or second primaries are in sheath there is no or very slight molt of the body feathers; at most a few new feathers may be coming in on the lower throat and upper breast. Even by the time that primary 6 is partly grown, the body molt may be restricted to a small area of the upper

or central breast, but usually by this time extensive feather replacement is occurring on the throat and breast, extending slightly down the flanks. Also at this stage molt is in progress on the upper back and on the anterior part of the crown. When primary 7 is in sheath, body molt has extended farther down the flanks and there are some new feathers on the upper and middle part of the back. Most of the anterior crown is new, and there are many feathers in sheath on the posterior crown and on the forehead. Molt of the ventral surface, except the lower flanks, may be nearly completed by the time primary 9 is in sheath, before primary 10 is lost, but even when this outermost primary is missing there may be many sheaths on the lower throat. At the latter stages the back will contain a mixture of old and new feathers with some in sheaths, and the crown will have many sheaths posteriorly. In birds, marked adult by collectors, in which all primaries have been replaced, all the body feathers are also new.

There is considerable variation between individuals in the timing of the annual molt. For example, birds with primary 5 in sheath were taken as early as 3 July and as late as 3 August. Individuals with primary 6 in sheath were taken on 24 June and 11 August. A bird with primary 9 in sheath was taken 27 August, whereas one with primary 10 in sheath was taken 27 July. These comparisons point up the fact that birds of a given date may be as much as 6 weeks, perhaps more, apart in plumage stage (or feather age). It is important to keep this in mind if one wishes to compare individuals or series in strictly comparable plumage.

Molt in juveniles.—The postjuvinal (first prebasic) molt of the body feathers of young nuthatches begins more or less simultaneously in several areas of the body. Sheaths appear early on the central throat and the upper breast, and at about the same time on the central crown and lower back. On the ventral surface, the area of new feather growth expands to the lower throat and central breast, and includes the upper part of the flanks. During this stage replacement of feathers dorsally expands to take in the entire crown. In a slightly later stage, when on the ventral surface many new feathers are showing through the old ones, molt is extensive on the throat and breast, extending posteriorly to the central flanks. Also at this time it is extensive on the crown and hindneck, and there are some sheaths on the central back. Molt progresses rapidly from this stage, with the entire body soon showing more new feathers than old. There is no replacement of flight feathers in this molt.

As in adults, there is a high degree of variability in the timing of the onset and completion of the molt. Birds in the very earliest stages of body molt have been taken as early as 12, 13, and 18 July, and as late as 16 September. Similarly, birds in the very latest stages of molt, or which have just completed the

molt, are available from 29 and 30 July, and from 22 and 24 September. This again points out that similar plumage stages may be as much as two months apart chronologically.

THE SUBSPECIFIC DISTINCTION

Birds taken in the months of November and December were sorted geographically, and eastern specimens were compared to western ones. Although the difference in color of the dorsal surface reported by Burleigh (1960) was evident, approximately 15 per cent of the birds fell into the "wrong" group when the birds were arranged by color and geography. The same situation held when birds from January and February were compared, or when samples from any relatively discrete time period were studied.

As noted earlier, however, birds taken in a given time period may differ by as much as 2 months in the age of the plumage; that is, one bird may have a feather coat that has been subject to 2 months more wear than another bird taken at the same time. To avoid comparing birds of different plumage ages, I selected birds that had just completed, or were just completing, the annual molt. When eastern and western examples of similar molt stages, or of similar plumage ages, were compared, no differences in color could be noted. Thus it appears that the wear that can take place during a period of approximately 2 months was at least in part responsible for the color difference that had been attributed to geographic variation. Once the color variation in specimens of similar collection date was noted, it was reasonable, although erroneous, to ascribe it to geographic factors because of the additional factors discussed below.

When I sorted birds taken in a particular month according to the subspecific names *canadensis* and *clariterga* that had previously been put on the labels, several of the former seemed at first to fit better with the series of lighter, bluer birds called *clariterga*. In every instance, however, closer examination refuted the first impression. Several of my colleagues at the U. S. National Museum were asked to examine the series, and each of them picked some or all of the same birds from the darker group for more critical comparison with the lighter group. On close comparison, however, none of those selected quite fit into the series called *clariterga*; all were too dark. It became evident that the birds selected were those in fresher, less worn plumage. Finally it was noted that the white superciliary stripes of these specimens showed considerable sooting, a condition that was present but not evident on other parts of the dorsal surface because of the general blue-gray color of the birds. More of the eastern birds were sooted, and thus darker, than western ones, presumably because of the greater degree of industrialization in the eastern part of North

America, which is thus a second factor to be considered in the apparent geographic variation.

Another determinant of the appearance of a color difference between eastern and western birds was the quality of the prepared skin. Not only were the supposed *canadensis* chosen for comparison with *clariterga* in fresh but sooted plumage, but they were also well prepared specimens, with the dorsal feathers very neatly arranged. It turned out that most of these selected eastern specimens had been collected by Burleigh. A result of the exceptional quality of Burleigh's specimens was that they were not strictly comparable to the main body of material in the collection. Because of his extensive work in the western portions of the United States there was a preponderance of better quality material from that part of the country in the U. S. National Museum for comparison with relatively poorly prepared material from the east.

SUMMARY

The postnuptial and postjuvinal molts of Red-breasted Nuthatches occur from middle June to late September. Some birds may be nearly finished with the complete molt before other individuals begin, so that specimens taken at any given time may differ by as much as two months in the age of their plumage. No characters useful in ageing birds after the completion of the autumn molt were found.

The proposed racial subdivision of *Sitta canadensis* was based on misleading evidence resulting from variation of plumage age in birds assumed to be seasonally comparable, sooting of birds in industrialized parts of the country, and variation in quality of prepared specimens.

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